

Crustacea Decapoda: Parapaguridae from the KARUBAR Cruise in Indonesia, with descriptions of two new species

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ABSTRACT

During the French-Indonesian KARUBAR campaign, ten species and a megalopal stage of deep-water hermit crabs of the family Parapaguridae, were collected. Two of the species found in the collection are undescribed, *Oncopagurus glebosus* sp. nov., and *Paragiopagurus insolitus* sp. nov., and are characterized by several unusual or unique characters. One previously described species, *Oncopagurus orientalis* (de Saint Laurent, 1972), was found to be insufficiently defined. These three species are described or diagnosed, and illustrated. Another species, *Parapagurus latimanus* Henderson, 1888, is reported for the first time from Indonesia. Two megalopal stage specimens of a parapagurid species cannot be assigned with certainty based on current knowledge, to any species; they are also illustrated and discussed. A list of all 15 parapagurid species currently known from Indonesian waters is presented, including references where diagnoses and illustrations can be found.

RÉSUMÉ

Crustacea Decapoda: Parapaguridae récoltés lors de la campagne KARUBAR en Indonésie. Descriptions de deux espèces nouvelles.

Durant la campagne franco-indonésienne KARUBAR, 10 espèces et un stade mégalope de pagures d'eau profonde de la famille des Parapaguridae ont été récoltés. Deux de ces espèces sont nouvelles: *Oncopagurus glebosus* et *Paragiopagurus insolitus* et se distinguent par plusieurs caractères inhabituels ou uniques. Une espèce décrite précédemment, *Oncopagurus orientalis* (de Saint Laurent, 1972) s'est révélée mal définie. Ces trois espèces sont donc l'objet d'une description ou d'une diagnose et sont illustrées. Une autre espèce, *Parapagurus latimanus* Henderson, 1888, est signalée pour la première fois d'Indonésie. Deux mégalopes de Parapaguridae ne peuvent être rattachées avec certitude à aucune espèce connue; elles sont également illustrées et discutées. Une liste des 15 espèces de Parapaguridae, connues des eaux indonésiennes, est établie, accompagnée de références où des diagnoses et des illustrations les concernant peuvent être trouvées.

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INTRODUCTION

The family Parapaguridae Smith, 1882, redefined by DE SAINT LAURENT (1972), in recent years has been the subject of revisionary studies that have established new generic boundaries and proposed a number of new genera (LEMAITRE, 1989, 1993, 1996; OSAWA, 1995). As result, ten genera are now recognized, five of which are monotypic: *Probeebei* Boone, 1926, *Tylaspis* Henderson, 1885, *Typhlopagurus* de Saint Laurent, 1972, *Bivalvopagurus* Lemaître, 1993, and *Tsunogaipagurus* Osawa, 1995; five others contain the remainder of the species: *Parapagurus* Smith, 1879, *Sympagurus* Smith, 1883, *Strobopagurus* Lemaître, 1989, *Oncopagurus* Lemaître, 1996, and *Paragiopagurus* Lemaître, 1996.

The parapagurid fauna from Indonesia is known largely from collections obtained in earlier expeditions such as the U.S. "Albatross" (late 1800's to early 1900's), Dutch *Siboga* Expedition (1899-1900), the Danish Th. MORTENSEN's Pacific Expedition (1914-1916), and the Danish *Galathea* (1950-1952). Based on these collections, 12 species of parapagurids have been reported from various Indonesian localities (DE SAINT LAURENT, 1972; LEMAITRE, 1994, 1996).

During the recent French-Indonesian deep-water sampling campaign known as KARUBAR, conducted from October to November of 1991 on board the "Baruna Jaya I", seven of the 12 species known to occur in the Indonesian region were obtained. In addition, the KARUBAR material was found to contain two distinctive new species, *Oncopagurus glebosus* sp. nov., and *Paragiopagurus insolitus* sp. nov., described herein. One species, *Parapagurus latimanus* Henderson, 1888, had not been previously reported from this region. Another species in this material, previously included in the genus *Sympagurus*, *S. orientalis* (de Saint Laurent, 1972), but recently assigned by LEMAITRE (1996) to the genus *Oncopagurus*, was found to be insufficiently defined. It is illustrated and diagnosed. Also reported and discussed are two megalopal stage specimens of an undetermined species of parapagurid. Although based on current knowledge these postlarvae cannot be assigned to any species, they are of interest because of the paucity of information on the larval development of parapagurids (LEMAITRE & MCLAUGHLIN, 1992).

The KARUBAR material remains deposited in the Muséum national d'Histoire naturelle, Paris (MNHN), except for some duplicates deposited in the National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM). For comparative purposes, paratypic material of *Oncopagurus orientalis* (de Saint Laurent), borrowed from the Zoölogisch Museum, Amsterdam (ZMA), and Zoologisk Museum, Copenhagen (ZMK), was examined.

In the material examined section, the length of the shield (to the nearest 0.1 mm), indicated in parentheses, is measured from the tip of the rostrum to the midpoint of the posterior margin of the shield. Measurements included for the megalopae are carapace length (CL), measured from the tip of the rostrum to the posterior midpoint of the carapace; and total length (TL), measured from the tip of the rostrum to the midpoint of the telson, excluding the telsonal setae. Abbreviations used are: immat., immature (sex indetermined); ovig., ovigerous; Stn, station.

The KARUBAR campaign was named for the islands of Kai, Aru, and Tanimbar.

The general terminology employed follows MCLAUGHLIN (1974). In the descriptive text, the term "semichelate" to describe the condition of the fourth and fifth pereopods, is used following MCLAUGHLIN's (1997: 435) definition, i.e. "where the ventral margin of the propodus is produced beneath the dactyl to such an extent that flexion of the dactyl becomes more akin to the action of a dactyl against a fixed finger of a chelate appendage". This is in contrast with the "subchelate" condition, "in which the pereopod is developed as a prehensile structure by the folding back of the dactyl against the propodus".

SYSTEMATIC ACCOUNT

Family PARAPAGURIDAE Smith, 1882

Genus *STROBOPAGURUS* Lemaitre, 1989*Strobopagurus sibogae* (de Saint Laurent, 1972)

Parapagurus sibogae de Saint Laurent, 1972: 116, figs 10, 23 (type locality: Indonesia, *Siboga* Exp. Stn 12).
Strobopagurus sibogae - LEMAITRE, 1989: 36; 1996: 167, fig. 1.

MATERIAL EXAMINED. — **Indonesia.** KARUBAR, *Kai Islands*: stn CP 36, 06°05'S, 132°44'E, 268-210 m, 27.10.1991: 2 ♀ 3.3, 4.7 mm (USNM 276034).

Tanimbar Islands: stn CP 83, 09°23'S, 131°00'E, 285-297 m, 4.11.1991: 1 ♀ 3.3 mm (MNHN-Pg 5380). — Stn CP 84, 09°23'S, 131°09'E, 275-246 m, 4.11.1991: 3 ♂ 3.4-4.4 mm, 1 ♀ 3.5 mm (MNHN-Pg 5381).

DISTRIBUTION. — Western Pacific: Indonesia; China Sea; Japan; and Australia. Depth: 40 to 550 m.

Genus *PARAPAGURUS* Smith, 1879*Parapagurus latimanus* Henderson, 1888

Parapagurus latimanus Henderson, 1888: 91, pl. 9, fig. 2 (type locality: "Challenger" Stn 167A, New Zealand). — MURRAY, 1895: 597. — GORDAN, 1956: 338. — LEMAITRE, 1986: 526; 1989: 11. — LEMAITRE & MCLAUGHLIN, 1992: 762, fig. 9.

Parapagurus pilosimanus latimanus - DE SAINT LAURENT, 1972: 103, pl. 1, fig. 5.

MATERIAL EXAMINED. — **Indonesia.** KARUBAR, *Tanimbar Islands*: stn CP 52, 08°03'S, 131°48'E, 1244-1266 m, 30.10.1991: 4 ♂ 4.2-8.9 mm, 2 ♀ 4.5, 4.8 mm (MNHN-Pg 5365). — Stn CP 87, 08°47'S, 130°49'E, 1017-1024 m, 5.11.1991: 1 ♂ 5.2 mm (USNM 276026).

DIAGNOSIS. — (See LEMAITRE & MCLAUGHLIN, 1992).

DISTRIBUTION. — Southern Australia (DE SAINT LAURENT, 1972); New Zealand; and now Indonesia. Depth: 909 to 1995 m.

Genus *SYMPAGURUS* Smith, 1883*Sympagurus brevipes* (de Saint Laurent, 1972)

Parapagurus brevipes de Saint Laurent, 1972: 105, figs 2, 14 (type locality: Indonesia, *Siboga* Exp. Stn 12).
Sympagurus brevipes - LEMAITRE, 1989: 37; 1994: 412; 1996: 170, figs 2, 3a-b, 4, 5a, 6.

MATERIAL EXAMINED. — **Indonesia.** KARUBAR, *Kai Islands*: stn CC 05, 05°49'S, 132°18'E, 296-299 m, 22.10.1991: 1 ♂ 18.5 mm, 1 ♀ ovig. 16.0 mm (MNHN-Pg 5373). — Stn CP 09, 05°23'S, 132°29'E, 368-389 m, 23.10.1991: 1 ♀ ovig. 14.4 mm (MNHN-Pg 5374). — Stn CC 10, 05°21'S, 132°30'E, 329-389 m, 23.10.1991: 1 ♂ 23.2 mm, 2 ♀ 9.6, 14.0 mm, 1 ♀ ovig. 14.4 mm (USNM 276027). — Stn CP 16, 05°17'S, 132°50'E, 315-349 m, 24.10.1991: 1 ♀ ovig. 13.6 mm (MNHN-Pg 5367). — Stn CP 26, 05°34'S, 132°52'E, 265-302 m, 26.10.1991: 1 ♂ 8.5 mm (MNHN-Pg 5370). — Stn CP 36, 06°05'S, 132°44'E, 268-210 m, 27.10.1991: 1 ♀ 15.8 mm, 1 ♀ ovig. 12.9 mm (MNHN-Pg 5366). — Stn CP 37, 06°07'S, 132°42'E, 363-241 m, 27.10.1991: 1 ♂ 16.1 mm (MNHN-Pg 5375).

Tanimbar Islands: stn CP 39, 07°47'S, 132°26'E, 477-466 m, 28.10.1991: 1 ♂ 21.1 mm (MNHN-Pg 5377). — Stn CP 45, 07°54'S, 132°47'E, 302-305 m, 29.10.1991: 1 ♀ 15.8 mm (MNHN-Pg 5376). — Stn CC 57, 08°19'S, 131°53'E, 603-620 m, 31.10.1991: 1 immat. 3.7 mm (MNHN-Pg 5371). — Stn CP 69, 08°42'S, 131°53'E, 356-368 m, 2.11.1991: 1 ♂ 5.5 mm, 1 ♀ 4.3 mm (MNHN-Pg 5372). — Stn CP 77, 08°57'S, 131°27'E, 352-346 m, 3.11.1991: 1 ♀ 5.4 mm (MNHN-Pg 5369).

KARUBAR. 1991. (No station data): 1 ♂ 22.5 mm (MNHN-Pg 5368).

DIAGNOSIS. — (See LEMAITRE, 1996).

DISTRIBUTION. — Indo-Pacific: Zanzibar; Indonesia; Philippines; and Australia. Depth: 210 to 794 m.

Sympagurus papposus Lemaitre, 1996

Sympagurus papposus Lemaitre, 1996: 180, figs 3c-d, 5 b, 8-10 (type locality: E of Broken Bay, New South Wales, Australia, FRV *Kapala* Stn K75-01-02).

MATERIAL EXAMINED. — Indonesia. KARUBAR, *Tanimbar Islands*: stn CC 40, 07°46'S, 132°31'E, 443-468 m, 28.10.1991: 1 ♂ 13.4 mm, 2 ♀ ovig. 121.1, 12.3 mm (MNHN-Pg 5379). — Stn CC 41, 07°45'S, 132°42'E, 401-393 m, 28.10.1991: 1 ♂ 14.6 mm (USNM 276033). — Stn CP 91, 08°44'S, 131°05'E, 884-891 m, 5.11.1991: 1 ♂ 7.0 mm (MNHN-Pg 5378).

DIAGNOSIS. — (See LEMAITRE, 1996).

DISTRIBUTION. — Indo-Pacific: Madagascar; Indonesia; and Australia. Depth: 205 to 960 m.

REMARKS. — As pointed out by LEMAITRE (1996), this species is very similar to *S. dofleini* (Balss, 1912). Females of *S. papposus* can be separated from males or females of *S. dofleini* by the armature of the anterior lobes of the telson. The left anterior lobe of the telson, and sometimes also the right anterior lobe, are armed ventrolaterally with a fringe or cluster of slender corneous spines mixed with bristle-like setae in *S. papposus*. The anterior lobes have in both sexes at most a row of setae in *S. dofleini*. Males of the two species, however, can only be separated using a number of subtle differences. The anterolateral projections of the shield are broadly rounded, often obsolete, in *S. papposus*; the projections are broadly triangular, often terminating acutely in *S. dofleini*. The spines on the antennal scales are stronger, and more broadly spaced in *S. papposus* than in *S. dofleini*. The distal lobe of the male first gonopod is broader in *S. papposus* than in *S. dofleini*. The two species also seem to utilize different habitats or symbiotic associations. *S. papposus* has been found living exclusively in large zoanthids (*Epizoanthus* sp.) whereas *S. dofleini* is most frequently found living in large actinians (*Stylobates* sp.).

Genus *ONCOPAGURUS* Lemaitre, 1996

Oncopagurus minutus (Henderson, 1896)

Parapagurus minutus Henderson, 1896: 531 (type locality: off the north Maldives Atoll, "*Investigator*" Stn 150). — ALCOCK & ANDERSON, 1897: pl. 32, fig. 3, 3a. — ALCOCK, 1901: 222; 1905: 101, pl. 10, fig. 3. — GORDAN, 1956: 338 (lit). — DE SAINT LAURENT, 1972: 108.

Sympagurus minutus - LEMAITRE, 1989: 37; 1994: 412.

Oncopagurus minutus - LEMAITRE, 1996: 201, fig. 21.

MATERIAL EXAMINED. — Indonesia. KARUBAR, *Tanimbar Islands*: stn CP 54, 08°21'S, 131°43'E, 836-869 m, 30.10.1991: 1 ♀ ovig. 3.1 mm (MNHN-Pg 5345). — Stn CP 87, 08°47'S, 130°49'E, 1017-1024 m, 5.11.1991: 1 ♂ 3.2 mm (MNHN-Pg 5346). — Stn CP 91, 08°44'S, 131°05'E, 884-891 m, 5.11.1991: 1 ♂ 3.0 mm (USNM 276030).

DIAGNOSIS. — (See LEMAITRE, 1996).

DISTRIBUTION. — Indo-Pacific: Maldives; Indonesia; and Australia. Depth: 800 to 2308 m.

Oncopagurus monstrosus (Alcock, 1894)

"*Parapagurus monstrosus*" Alcock, 1894: 243 [type locality, by lectotype designation (LEMAITRE, 1996: 199): Bay of Bengal].

- Sympagurus monstrosus* - HENDERSON, 1896: 533. — ALCOCK & ANDERSON, 1897: pl. 32, fig. 4. — ALCOCK, 1901: 223. — LEMAITRE, 1989: 37; 1994: 412.
- Sympagurus arcuatus* var. *monstrosus* - ALCOCK, 1905: 104, pl. 10, fig. 5. — GORDAN, 1956: 341. — KEMP & SEWELL, 1912: 26.
- Parapagurus monstrosus* - DE SAINT LAURENT, 1972: 108. — MIYAKE, 1978: 72; 1982: 119, pl. 40, fig. 1. — BABA *et al.*, 1986: 302, fig. 146. — IMAFUKU, 1992: 234, unnumbered fig.
- Oncopagurus monstrosus* - LEMAITRE, 1996: 199, figs 19, 20.
- Not *Parapagurus arcuatus* var. *monstrosus* - BALSS, 1912: 99, pl. 10, fig. 3. [= *Sympagurus brevipes* (de Saint Laurent, 1972)].

MATERIAL EXAMINED. — **Indonesia.** KARUBAR, *Kai Islands*: stn CC 10, 05°21'S, 132°30'E, 329-389 m, 23.10.1991: 1 ♂ 6.1 mm (MNHN-Pg 5348), 1 ♀ 3.1 mm (USNM 276028). — Stn CP 12, 05°23'S, 132°37'E, 436-413 m, 23.10.1991: 1 ♂ 4.9 mm (MNHN-Pg 5351). — Stn CP 26, 05°34'S, 132°52'E, 265-302 m, 26.10.1991: 1 ♂ 5.1 mm (USNM 276029). — Stn CP 35, 06°08'S, 132°45'E, 390-502 m, 27.10.1991: 3 ♂ 3.2-4.3 mm, 2 ♀ 2.4, 2.5 mm (MNHN-Pg 5352).

Tanimbar Islands: stn CP 39, 07°47'S, 132°26'E, 477-466 m, 28.10.1991: 1 ♂ 3.4 mm (MNHN-Pg 5350). — Stn CP 69, 08°42'S, 131°53'E, 356-368 m, 2.11.1991: 1 ♂ 5.1 mm (MNHN-Pg 5349). — Stn CP 70, 08°41'S, 131°47'E, 413-410 m, 2.11.1991: 1 ♀ 4.5 mm (MNHN-Pg 5347).

DIAGNOSIS. — (See LEMAITRE, 1996).

DISTRIBUTION. — Indo-Pacific: Gulf of Aden; Bay of Bengal; Japan; Philippines; Indonesia; and Australia. Depth: 202 to 1000 m.

Oncopagurus orientalis (de Saint Laurent, 1972)

Figs 1-2

Parapagurus orientalis de Saint Laurent, 1972: 114, figs. 8, 16.

Sympagurus orientalis - LEMAITRE, 1989: 37; 1994: 412.

TYPE MATERIAL. — *Holotype*: **Philippines Islands.** "Albatross": stn 5289, southern Luzon, 13°41'50"N, 120°58'30"E, 314 m, 22 07.1908: ♂ 2.9 mm (USNM 168311).

Paratypes: **Philippines Islands.** "Albatross": stn 5268, Batangas Bay, 13°42'N, 120°57'15"E, 170 fms (311 m), 8.06.1908: 3 ♂ 2.0-2.4 mm (USNM 168320). — Th. MORTENSEN's Pacific Exp. 1914-16, 3 mi SW of Tukuran, 550 m, 10.03.1914: 1 ♀ 1.7 mm (ZMK).

Paratypes: **Indonesia.** "Siboga": stn 137, 00°23.8'N, 127°29'E, 472 m, 3.VIII.1899, coll. M. WEBER: 2 ♂ 1.7, 1.9 mm (ZMA De 103.108). — "Galathea" Exp. 1950-52: stn 490, Bali Sea, 05°25'S, 117°03'E, 545-570 m, 14.09.1951: 1 ♀ ovig. 1.8 mm (ZMK).

ADDITIONAL MATERIAL EXAMINED. — **Indonesia.** KARUBAR, *Kai Islands*: stn CP 35, 06°08'S, 132°45'E, 390-502 m, 27.10.1991: 1 ♂ 2.5 mm, 1 ♀ 2.2 mm (MNHN-Pg 5353).

DIAGNOSIS. — Shield (Fig. 1a) as long as broad; dorsal surface weakly calcified medially; rostrum broadly rounded, with low dorsal ridge; anterior margins weakly concave; lateral projections broadly subtriangular, usually terminating in small spine; ventrolateral margin armed with small spine; posterior margin broadly rounded. Ocular peduncles more than half length of shield; ocular acicles subtriangular, terminating in strong bifid or occasionally multifid spine; corneae weakly dilated. Sternite of third maxillipeds with small spine on each side of midline. Antennular peduncle, when fully extended (not shown extended in Fig. 1a), exceeding distal margin of cornea by full length of ultimate segment. Antennal peduncle (Fig. 1b) not exceeding distal margin of cornea; third segment with strong ventromesial distal spine; second segment with dorsolateral distal angle produced, terminating in strong spine; first segment with small lateral spine; acicle not exceeding distal margin of cornea, mesial margin armed with 8 to 12 spines; flagellum with series of short setae (<1 article in length) and long setae (>3 articles in length) every 4 to 8 articles. Chelipeds markedly dissimilar, with some iridescence and moderately dense setae. Right cheliped (Fig. 2a-e) with chela longer than broad; fingers moderately curved ventromesially; dactyl with concave ventromesial face; palm with scattered small spines on dorsal face, dorsolateral and dorsomesial margins each well delimited by row of spines; mesial face of palm rounded, with small spines or tubercles. Left cheliped (Fig. 2f) with carpus weakly calcified on dorsal surface; carpus with dorsodistal spine. Ambulatory legs (Fig. 1c-d)

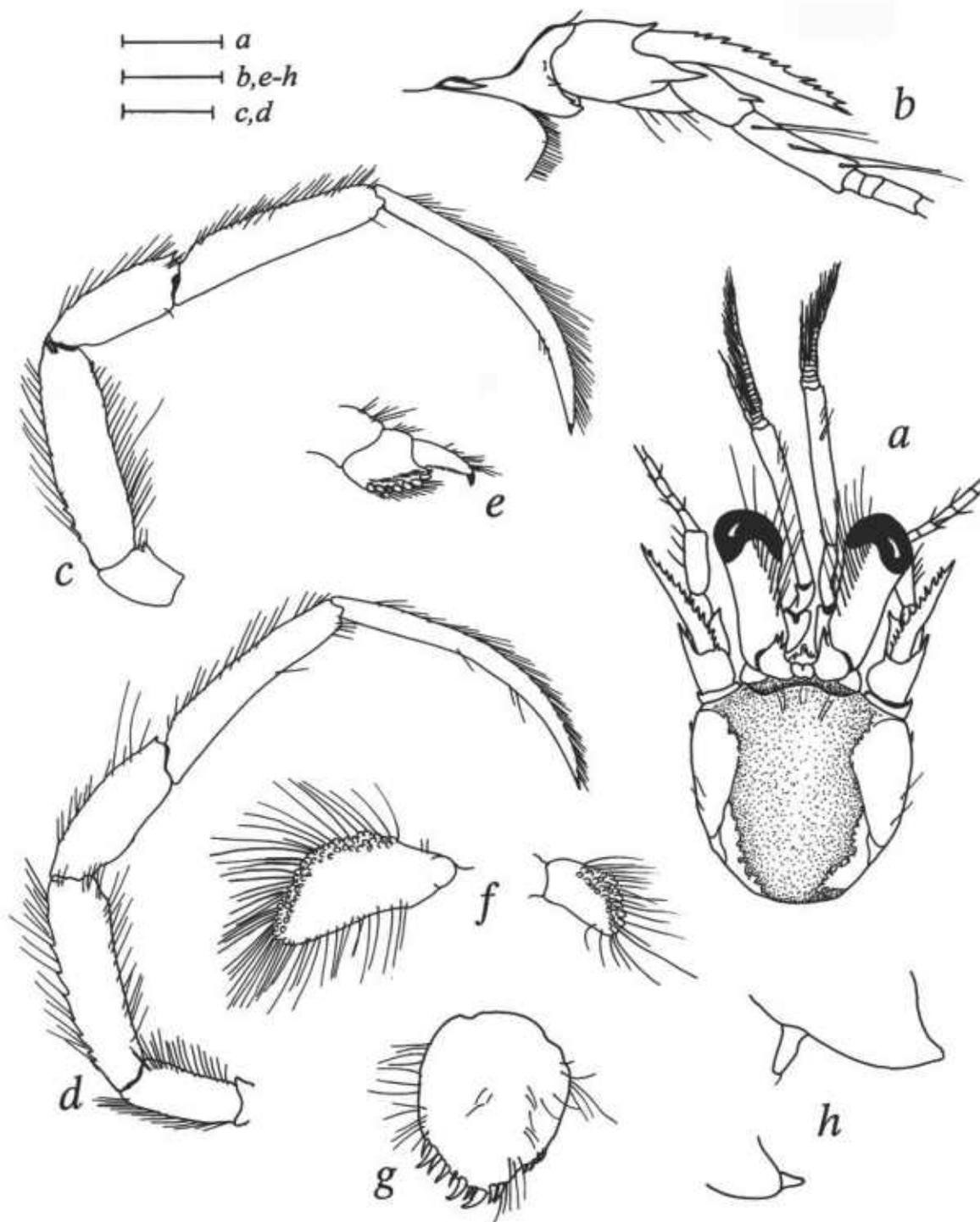


FIG. 1. — *Oncopagurus orientalis* (de Saint Laurent, 1972), KARUBAR Stn CP 35 (MNHN-Pg 5353). a-g, ♀ (2.2 mm); h, ♂ (2.5 mm): a, shield and cephalic appendages; b, right antennal peduncle, lateral view; c, right second pereopod, lateral view; d, right third pereopod, lateral view; e, propodus and dactyl of right fourth pereopod, lateral view; f, left (on left) and right (on right) uropods, dorsal view; g, telson, dorsal view; h, male second right (upper) and left (lower) pleopods, lateral view. Scales equal 1 mm (a, c, d), and 0.5 mm (b, e-h).

slender; dactyl with 1 to 4 minute spinules (usually not visible in lateral view) on ventromesial margin, and dorsal and dorsomesial rows of long setae; carpus with small dorsodistal spine; merus of right third pereopod with row of small spines on dorsal margin; meri of left second and third pereopods with dorsal margins unarmed. Anterior lobe of sternite of third pereopods with small marginal spine, setose. Fourth pereopod (Fig. 1e) with dactyl terminating in short, corneous claw in both sexes; propodal rasp consisting of ovate scales. Uropods and telson (Fig. 1f-g) markedly asymmetrical. Telson lacking transverse suture separating anterior and posterior lobes;

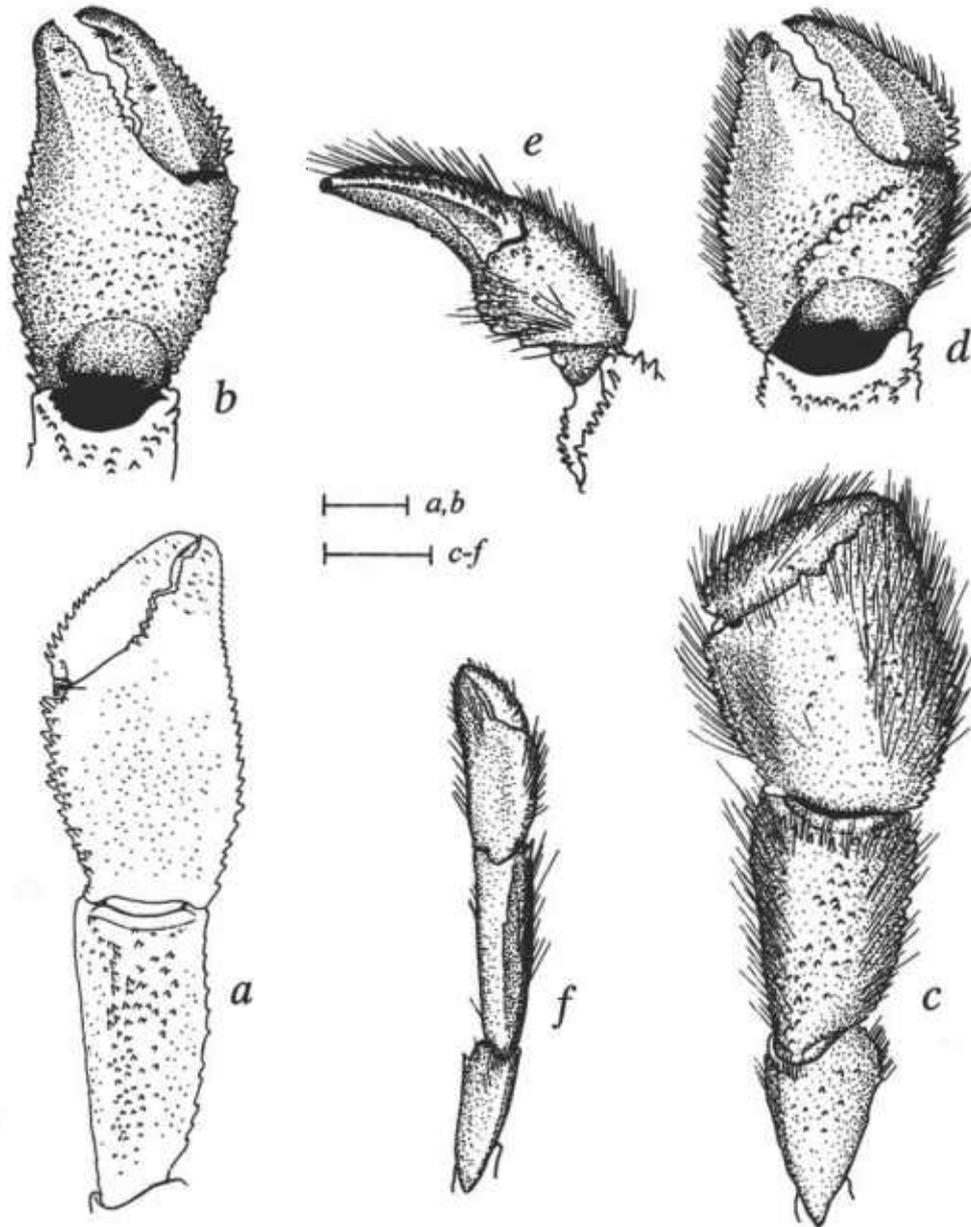


FIG. 2. — *Oncopagurus orientalis* (de Saint Laurent, 1972), a-b, holotype, ♂ (2.9 mm), "Albatross" Stn 5289, Philippines (USNM 168311); c-f, ♀ (2.2 mm), KARUBAR Stn CP 35 (MNH-Pg 5353): a, carpus and chela of right cheliped (from DE SAINT LAURENT, 1972); b, chela of same, ventral view; c, right cheliped, dorsal view; d-e, chela of same in ventral (d) and mesial (e) views; f, left cheliped, dorsal view. Scales equal 1 mm.

posterior lobes separated by shallow U-shaped median cleft, right lobe weakly developed (frequently obsolete), terminal margins armed with often strongly curved corneous spines. Male lacking first gonopods; second gonopods (Fig. 1h) vestigial or rudimentary, unsegmented, usually paired, asymmetrical, or sometimes with unpaired left. Females with vestigial right second pleopod.

HABITAT AND SYMBIOTIC ASSOCIATIONS. — The KARUBAR specimens were found living in coarse-textured zoanths. Other specimens have been found in gastropod shells.

DISTRIBUTION. — Indo-Pacific: Philippines; Moluccas; Indonesia. Depth: 300 to 575 m.

REMARKS. — *Oncopagurus orientalis* is one of four *Oncopagurus* species in which males lack first gonopods and the second gonopods are vestigial or rudimentary. The others are *O. haigae* de Saint Laurent, 1972, *O. tuamotu* Lemaitre, 1994, and *O. cidaris* Lemaitre, 1996. The multifid condition of the ocular acicles in *O. orientalis* is the most obvious character that immediately distinguishes this species from the other three. Although the four species are otherwise superficially similar, they differ in such characters as the shape and armature of the right cheliped; relative length of dactyls of ambulatory legs; presence or absence of sexual dimorphism in the dactyl of the fourth pereopod; and in males, degree of development of the second gonopods.

The right palm of *O. orientalis* shows some degree of variability in length, and also in armature of the ventral face. As expected, such variability is related to size and sex of the individuals. The palm of the male holotype, for example, is longer than broad (Fig. 2a), whereas in KARUBAR females the palm is broader than long (Fig. 2c). The armature of the ventral face can consist of scattered small tubercles (Fig. 2b), or scattered small tubercles and moderately large tubercles often arranged in an oblique row (Fig. 2d).

Oncopagurus glebosus sp. nov.

Figs 3-6

MATERIAL EXAMINED. — *Holotype*: Indonesia, KARUBAR, Tanimbar Islands: stn CP 86, 09°26'S, 131°13'E, 225-223 m, 4.11.1991: ♂ 1.8 mm (MNHN-Pg 5342).

Paratypes: Indonesia, KARUBAR, Tanimbar Islands: stn DW 49, 08°00'S, 132°59'E, 210-206 m, 29.10.1991: 15 ♂ 1.4-2.6 mm, 2 ♀ ovig. 2.2, 2.3 mm, 1 juv. 1.2 mm (MNHN-Pg 5344). — Stn DW 80, 09°37'S, 131°02'E, 199-201 m, 4.11.1991: 5 ♂ 1.2-2.7 mm, 2 ♀ 1.2, 1.5 mm, 1 ♀ ovig. 1.8 mm (USNM 276035). — Stn CP 86, 09°26'S, 131°13'E, 225-223, 4.11.1991: 2 ♂ 1.3, 1.7 mm (MNHN-Pg 5343), 1 ♂ 2.3 mm, 2 ♀ 1.3, 2.7 mm, 1 ♀ ovig. 2.5 mm (USNM 276036).

DESCRIPTION. — Shield (Fig. 3a) as broad as long; dorsal surface weakly calcified on usually more than half of surface, with scattered tufts of short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins concave; lateral projections subtriangular, terminating in small spine; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield with small spine on one or both sides. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles more than half length of shield, with dorsal row of long setae. Cornea moderately dilated. Ocular acicles subtriangular, terminating bluntly or subacutely; with strong submarginal spine; separated basally by less than basal width of 1 acicle.

Antennular peduncle long, slender; when fully extended (not shown extended in Fig. 3a), exceeding distal margin of cornea by entire length of ultimate segment. Ultimate segment twice as long as penultimate segment, with scattered setae. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe armed with 1 small spine, and strong spine proximally. Ventral flagellum usually with 5 or 6 articles.

Antennal peduncle (Fig. 3b) reaching distal margin of cornea. Fifth segment unarmed, but with scattered setae. Fourth segment with strong dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong, simple spine; mesial margin with spine on dorsodistal angle. First segment with 1 small spine on lateral face; ventromesial angle produced, with row of 3 or 4 small spines laterally. Antennal acicle slightly curved outward (in dorsal view), not reaching distal margin of cornea, terminating in strong spine (rarely bifid); mesial margin armed with row of 8 to 11 spines. Flagellum

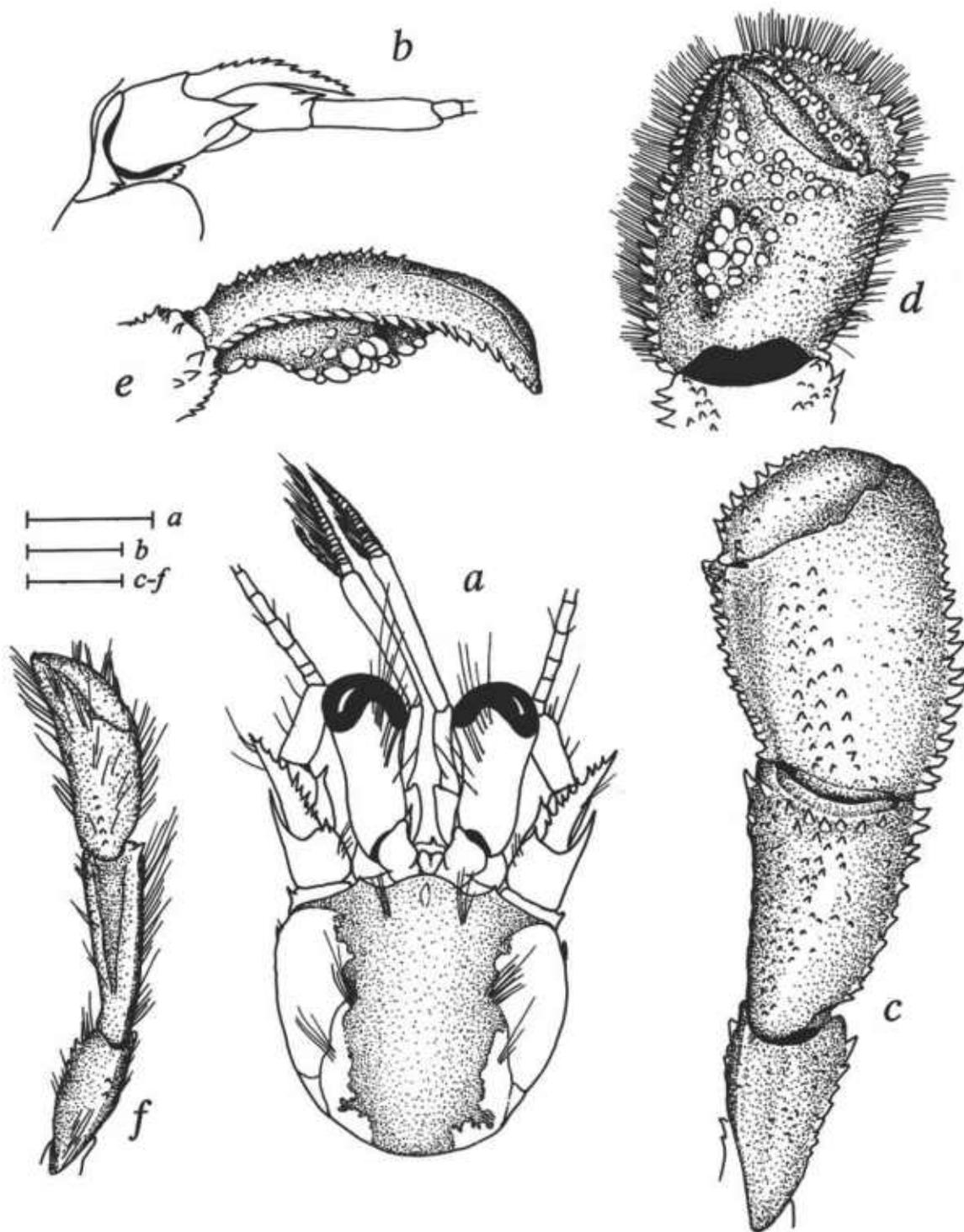


FIG. 3. — *Oncopagurus glebosus* sp. nov., paratype ♂ (2.3 mm), KARUBAR Stn CP 86 (USNM 276036): a, shield and cephalic appendages; b, right antennal peduncle, lateral view; c, right cheliped, lateral view (setae omitted); d-e, chela of same in ventral (d) and lateral (e) views (setae omitted in e); f, left cheliped, dorsal view. Scales equal 1 mm (a, c-f), and 0.5 mm (b).

long, exceeding extended right cheliped and ambulatory legs; with serial arrangement of short (<1 article in length) and long (3-5 articles in length) setae every 2-4 articles.

Mandible (Fig 4a) as figured. Maxillule (Fig. 4b) with external lobe of endopod weakly developed, internal lobe with 1 long seta. Maxilla (Fig. 4c) with endopod exceeding distal margin of scaphognathite. First maxilliped (Fig. 4d) with endopod exceeding exopod in distal extension. Second maxilliped (Fig. 4e) with exopod about 4 times as long as broad. Third maxilliped (Fig. 4f) with exopod about 6.5 times as long as broad; crista dentata consisting of about 8 calcareous or corneous-tipped teeth; basis with 1 tooth mesially; coxa unarmed or with small tooth mesially. Sternite of third maxillipeds with small spine on each side of midline.

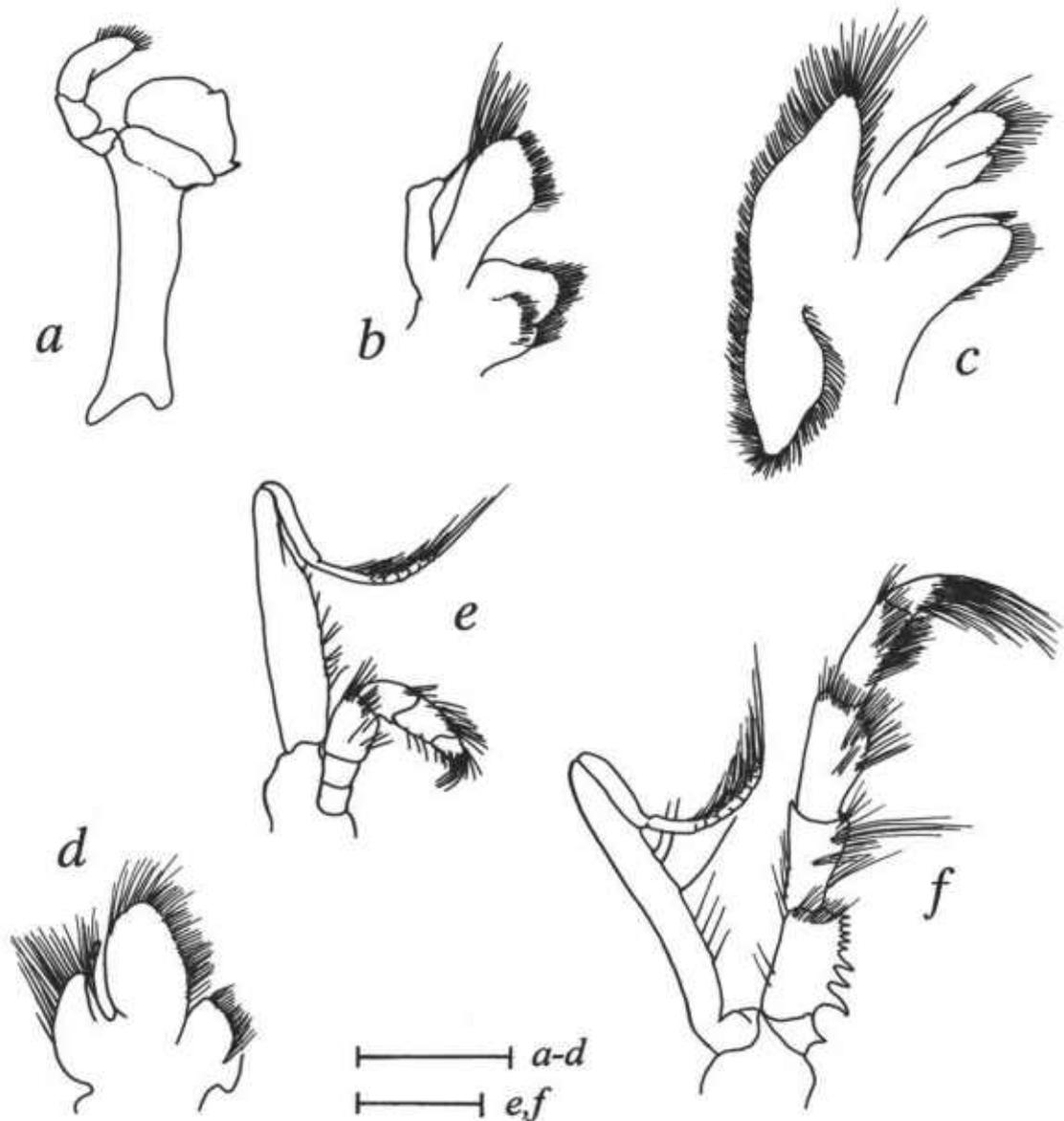


FIG. 4. — *Oncopagurus glebosus* sp. nov., paratype ♂ (2.3 mm), KARUBAR Stn CP 86 (USNM 276036). Left mouthparts, internal view (plumose condition of setae not shown): a, mandible; b, maxillule; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped. Scales equal 0.5 mm.

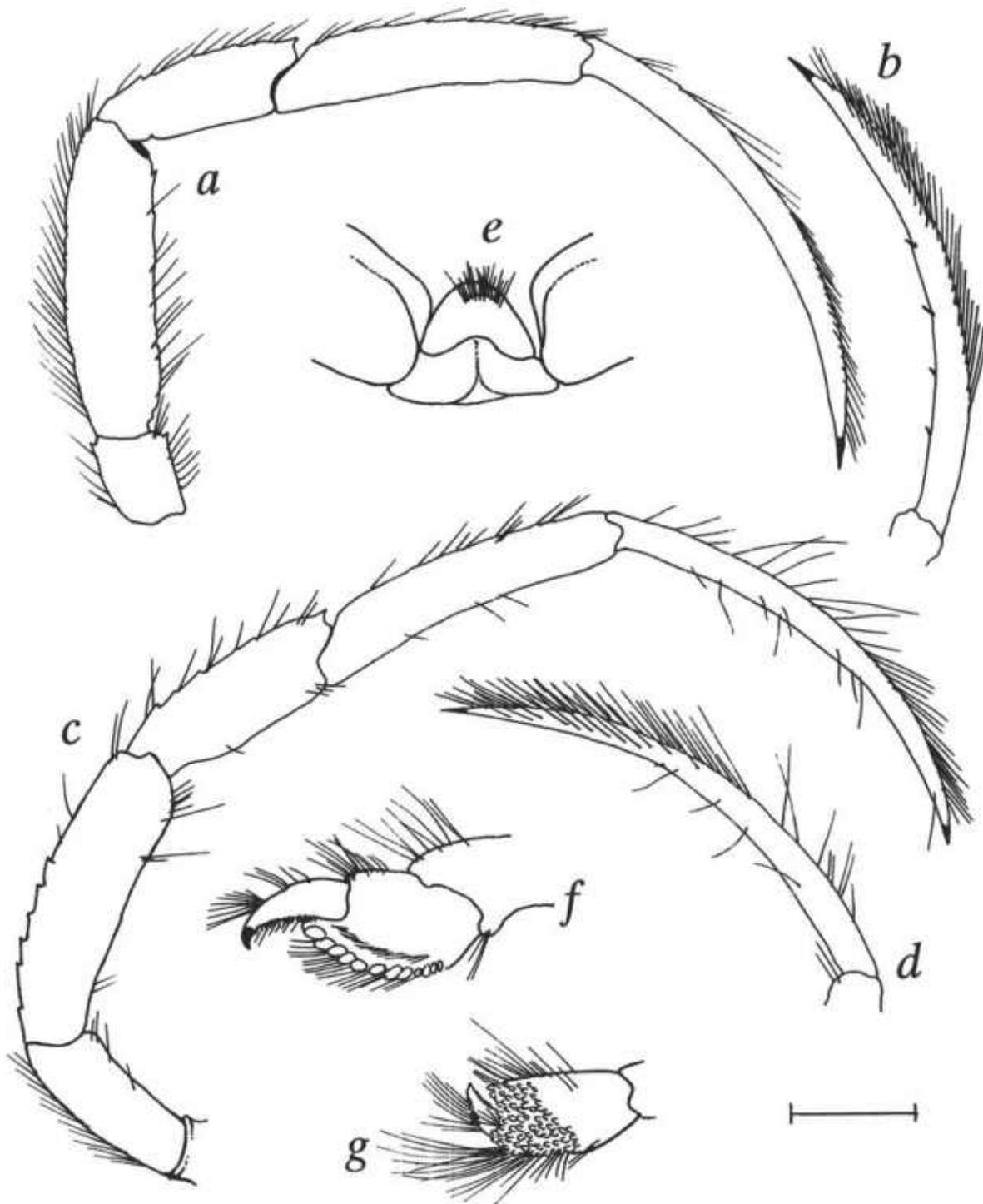


FIG. 5. — *Oncopagurus glebosus* sp. nov., paratype ♂ (2.3 mm), KARUBAR Stn CP 86 (USNM 276036): a, second right pereopod, lateral view; b, dactyl of same, mesial view; c, right third pereopod, lateral view; d, dactyl of same, mesial view; e, sternite of third pereopods, ventral view; f, propodus and dactyl of left pereopod, lateral view; g, propodus and dactyl of left fifth pereopod, lateral view. Scale equals 1 mm (a-d), and 0.5 mm (e-g).

Chelipeds markedly dissimilar. Right cheliped (Fig. 3c-e) massive; dorsal surfaces of merus, carpus and chela each with moderately dense setae (not shown in Fig. 3c, e); chela with dense fringe of long setae on lateral and mesial margins. Fingers curved ventromesially, terminating in small, usually blunt corneous claws; cutting edges with irregularly-sized calcareous teeth. Dactyl about as long as mesial margin of palm, set at strongly oblique angle to longitudinal axis of palm; mesial margin broadly curved, well delimited by row of strong spines diminishing in size distally; dorsal face with scattered small tubercles; ventral face with longitudinal ridge covered with irregular rows of tubercles; ventromesial face concave. Fixed finger broad at base, dorsal face with scattered small tubercles, lateral margin well delimited by row of spines; ventrolateral face often strongly concave, ventral face with median longitudinal ridge covered with irregular rows of tubercles. Palm longer than broad, dorsolateral margin well delimited by row of strong spines; dorsomesial margin delimited by row of spines; mesial face rounded, with scattered tubercles; dorsal surface with irregular rows of spines medially; ventral surface (Fig. 3d-e) with irregularly arranged tubercles or blunt spines, and raised frequently very prominent cluster of tubercles medially. Carpus with dorsolateral margin usually well delimited by row of spines distally, rounded proximally; dorsodistal margin with row of spines; dorsal face with numerous small spines; ventromesial margin with row of spines; ventral face with scattered small tubercles. Merus with scattered tubercles on dorsal face; ventromesial margin with row of spines. Ischium with ventromesial row of spines. Coxa with ventromesial and ventrolateral margins each with small distal spine.

Left cheliped (Fig. 3f) usually weakly calcified on dorsolateral face of carpus and on lateral face of merus. Fingers terminating in small corneous claws; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of regularly spaced, small, evenly-sized calcareous teeth. Dactyl slightly longer than length of mesial margin of palm. Palm unarmed except for scattered setae and proximomedial row of blunt spines on dorsal face. Carpus with strong dorsodistal spine, and smaller spine laterally on dorsodistal margin; dorsal margin with long setae; ventral face smooth. Merus with long setae on dorsal margin; with ventrolateral row of spines, and small ventromesial spine distally. Ischium and coxa each with 1 small spine on ventromesial and ventrolateral margins distally.

Ambulatory legs (Fig. 5a-d) similar, exceeding extended right cheliped by approximately 0.25 length of dactyl. Dactyls broadly curved, about 1.6 times as long as propodi, and terminating in sharp corneous claws; each with dorsal and dorsomesial rows of long setae, and 1-5 minute spinules on ventromesial margin. Propodi each with row of setae on dorsal margin. Carpi each with small dorsodistal spine, and setae dorsally. Meri unarmed except for 1 or 2 small ventrodistal spines (second pereopod) or with row of small spines on dorsal margin (third pereopod). Ischia with small dorsodistal and ventrodistal spine (second) or unarmed (third). Coxae with 1 small spine on ventromesial and ventrolateral margins distally (second) or unarmed (third). Anterior lobe of sternite of third pereopods (Fig. 5e) rounded, setose, unarmed or with small subdistal spine.

Fourth pereopod (Fig. 5f) semichelate. Dactyl terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp formed of 1 row of rounded scales. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal and ventral margins.

Fifth pereopod (Fig. 5g) semichelate. Propodal rasp extending to mid-length of segment.

Uropods and telson (Fig. 6a-c) markedly asymmetrical. Telson lacking transverse suture; dorsal surface with scattered setae; posterior lobes separated by shallow unarmed cleft, terminal margin of lobes armed with long, often strongly curved corneous spines.

Males with paired first and second gonopods; first gonopods not yet appearing or not fully developed in juveniles (SL <1.5 mm). First gonopods (Fig. 6d) each with nearly flat distal lobe and long marginal setae. Second gonopods (Fig. 6e) each with distal segment flat; distal half of distal segment with long setae marginally and on anterior face; basal segments each with row of setae laterally. Females with vestigial second right pleopod.

HABITAT. — Gastropod shells.

DISTRIBUTION. — Known so far only from Tanimbar Islands, Indonesia. Depth: 199 to 225 m.

ETYMOLOGY. — The specific name is from the Latin *glebosus*, meaning lumpy, and is in reference to the lumpy appearance given by tubercles to the ventral face of the right chela.

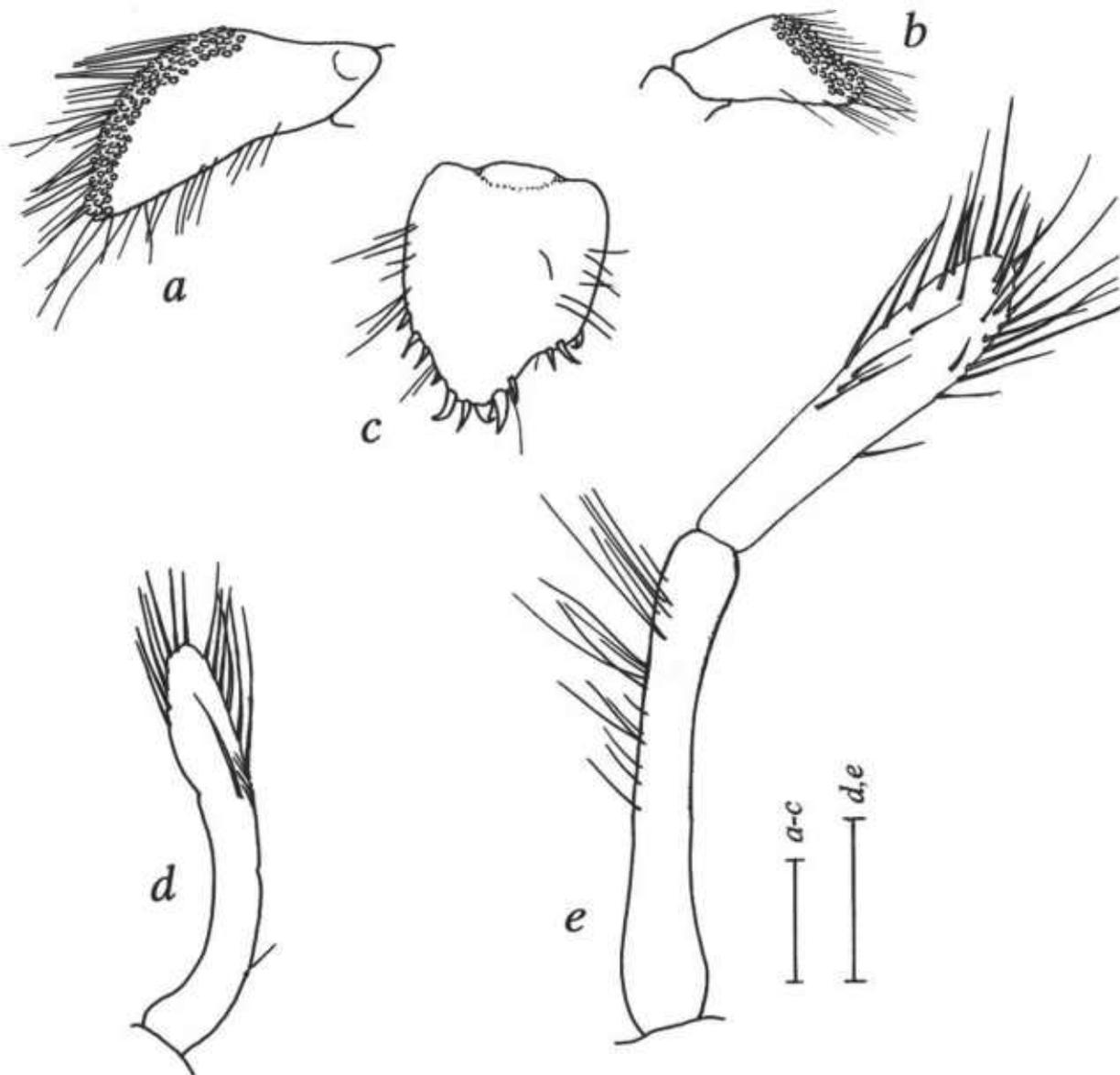


FIG. 6. — *Oncopagurus glebosus* sp. nov., paratype ♂ (2.3 mm), KARUBAR Stn CP 86 (USNM 276036): a-b, left (a) and right (b) uropods, dorsal view; c, telson, dorsal view; d, male first left gonopod, mesial view; e, male second left gonopod, anterior view. Scales equal 0.5 mm (a-c), and 0.25 mm (d-e).

REMARKS. — *Oncopagurus glebosus* sp. nov. is distinguished not only from all its congeners but from all other parapagurids, by the unique condition of the ocular acicles. This is the only species in the family known to have ocular acicles with a submarginal spine. The ocular acicles in all other parapagurids (except the highly specialized *Tylaspis anomala* Henderson, 1885, which lacks acicles), terminate in a simple to multifid marginal spine.

The distinct armature of the ventral surface of the right palm also distinguishes *O. glebosus* sp. nov. from other *Oncopagurus* species. The ventral surface has numerous irregularly arranged tubercles, some of which frequently form a prominent cluster medially (Fig. 3d). The cluster is usually markedly raised above the surface; in

small individuals (SL < 1.5 mm) it is not as prominent, and the tubercles may be smaller and wider apart than in large individuals. The presence of prominent armature in the form of spines or variously shaped tubercles on the ventral face of the right chela is a condition present in three other parapagurid species, *Paragiopagurus boletifer* (de Saint Laurent, 1972), *P. rugosus* (de Saint Laurent, 1972), and *Tsunogaipagurus chuni* (Balss, 1911).

Genus *PARAGIOPAGURUS* Lemaitre, 1996

Paragiopagurus acutus (de Saint Laurent, 1972)

Parapagurus acutus acutus de Saint Laurent, 1972: 113, figs 7, 18 (type locality: Philippines, "Albatross" Stn 5222).

Sympagurus acutus acutus - LEMAITRE, 1989: 37; 1994: 412.

Paragiopagurus acutus - LEMAITRE, 1996: 211, figs 25-26.

MATERIAL EXAMINED. — **Indonesia.** KARUBAR, *Kai Islands*: stn DW 28, 05°31'S, 132°54'E, 448-467 m, 26.10.1991: 1 ♀ immat. 1.5 mm (MNHN-Pg 5362). — Stn CP 27, 05°33'S, 132°51'E, 304-314 m, 26.10.1991: 1 ♀ 4.7 mm (MNHN-Pg 5359). — Stn CP 36, 06°05'S, 132°44'E, 268-210 m, 27.10.1991: 1 ♂ 6.4 mm (MNHN-Pg 5360).

Tanimbar Islands: stn CC 56, 08°16'S, 131°59'E, 552-549 m, 31.10.1991: 2 ♂ 4.8, 5.2 mm, 1 ♀ 3.7 mm (USNM 276032). — Stn CP 67, 08°58'S, 132°06'E, 233-146 m, 1.11.1991: 3 ♀ 4.3-4.6 mm, 1 ♀ ovig. 3.7 mm (MNHN-Pg 5355). — Stn CP 77, 08°57'S, 131°27'E, 352-346 m, 3.11.1991: 4 ♂ 5.2-6.6 mm (MNHN-Pg 5358). — Stn CP 79, 09°16'S, 131°22'E, 250-239 m, 3.11.1991: 9 ♂ 2.2-4.5 mm, 6 ♀ 3.7-4.5 mm, 2 ♀ ovig. 4.0, 4.3 mm (USNM 276031). — Stn CP 83, 09°23'S, 131°00'E, 285-297 m, 4.11.1991: 2 ♂ 4.1, 6.0 mm (MNHN-Pg 5356). — Stn CP 84, 09°23'S, 131°09'E, 275-246 m, 4.11.1991: 26 ♂ 1.7-4.6 mm, 12 ♀ 1.6-4.0 mm, 12 ♀ ovig. 3.0-3.9 mm (MNHN-Pg 5361). — Stn CP 85, 09°22'S, 131°14'E, 245-240 m, 4.11.1991: 8 ♂ 3.5-5.0 mm (MNHN-Pg 5357). — Stn CP 86, 09°26'S, 131°13'E, 225-223 m, 4.11.1991: 3 ♂ 2.2-3.7 mm (MNHN-Pg 5354).

DIAGNOSIS. — (See LEMAITRE, 1996).

COLOR. — The following coloration is based on a male (6.4 mm, Stn CP 36, MNHN-Pg 5360) after preservation in alcohol for four years. Overall straw white to yellowish. Shield with small light orange area on each side of anterior half. Ocular peduncles dark orange on ventral face, dorsal face faded orange. Right cheliped with dorsal surface of chela having small light orange area proximally; carpus with three wide orange stripes (one dorsal, one mesial, one lateral); merus with two stripes (one lateral, one mesial). Carpus of left cheliped with orange stripe on lateral face, and light orange tint on mesial face. Ambulatory legs with orange tint on lateral faces of carpi and propodi (more strongly colored on carpi); with orange area on lateral and mesial faces of meri.

DISTRIBUTION. — Western Pacific: Philippines, China Sea, Indonesia, Japan, and Australia. Depth: 146-558 m.

Paragiopagurus insolitus sp. nov.

Figs 7-10

MATERIAL EXAMINED. — **Holotype:** **Indonesia.** KARUBAR, *Kai Islands*: stn DW 28, 05°31'S, 132°54'E, 448-467 m, 26.10.1991: ♂ 2.2 mm (MNHN-Pg 5363).

Paratypes: **Indonesia.** KARUBAR, *Kai Islands*: stn DW 28, 05°31'S, 132°54'E, 448-467 m, 26.10.1991: 3 ♂ 1.3-1.8 mm, 1 ♀ ovig. 1.7 mm (MNHN-Pg 5364); 1 ♂ 2.0 mm, 1 ♀ ovig. 1.6 mm (USNM 276037).

DESCRIPTION. — Shield (Fig. 7a) slightly longer than broad; dorsal surface weakly calcified on usually more than half of surface, with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections subtriangular, terminating in small spine; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins with small spine on one or both sides. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles more than half length of shield, each with dorsal row of long setae. Cornea at most weakly dilated. Ocular acicles subtriangular, terminating in long slender spine reaching nearly to mid-length of ocular peduncles; separated basally by less than basal width of 1 acicle.

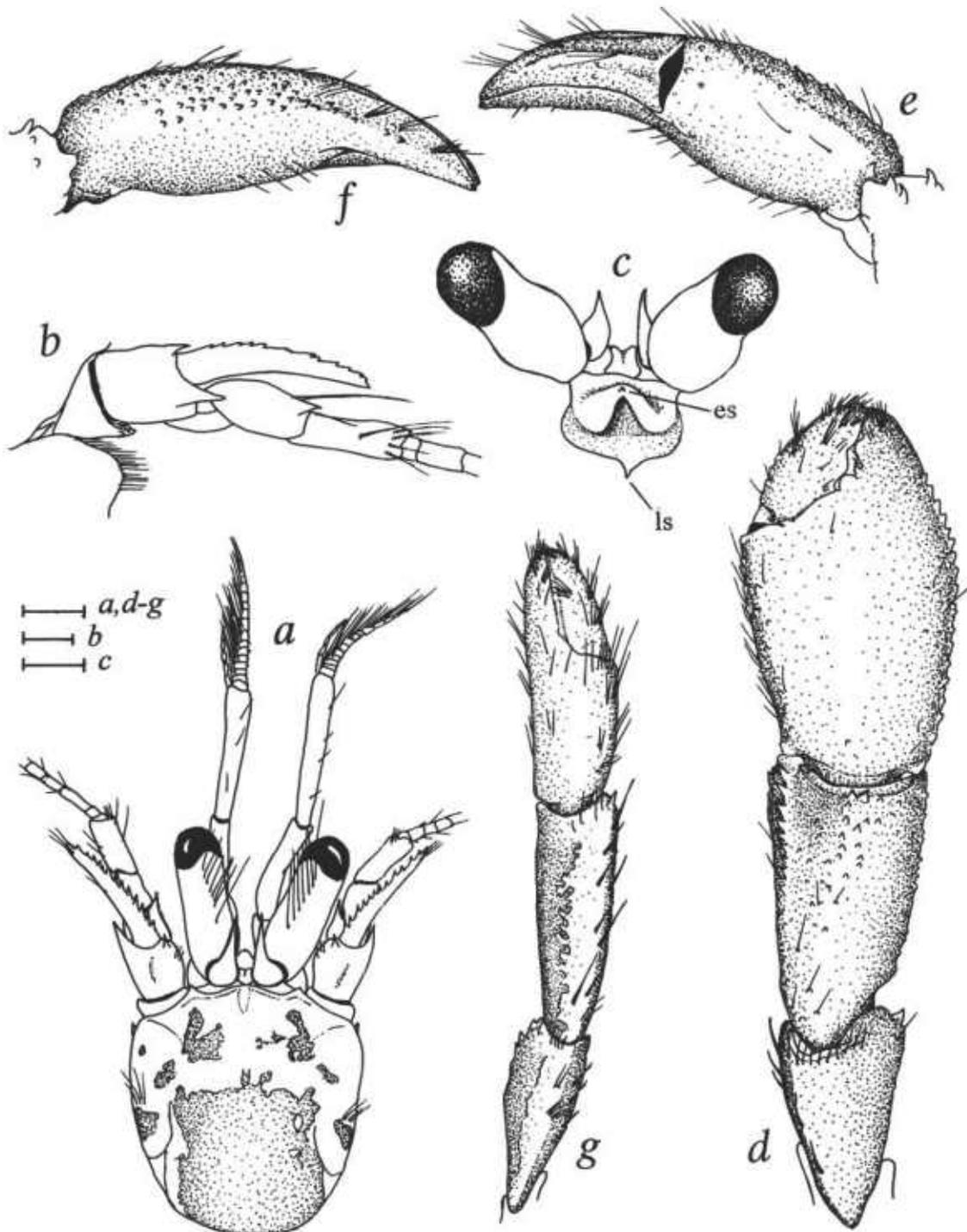


FIG. 7. — *Paragiopagurus insolitus* sp. nov., KARUBAR Stn DW 28. a-b, d-g, holotype ♂ (2.2 mm) (MNHN-Pg 5363); c, paratype ♂ (2.0 mm) (USNM 276037): a, shield and cephalic appendages; b, right antennal peduncle, lateral view; c, epistome, ocular peduncles and acicles, anterior view (es, epistomial spine; ls, labral spine); d, right cheliped, dorsal view; e-f, chela of same in mesial (e) and lateral (f) views; g, left cheliped, dorsal view. Scales equal 0.5 mm (a, d-g), and 0.25 mm (b, c).

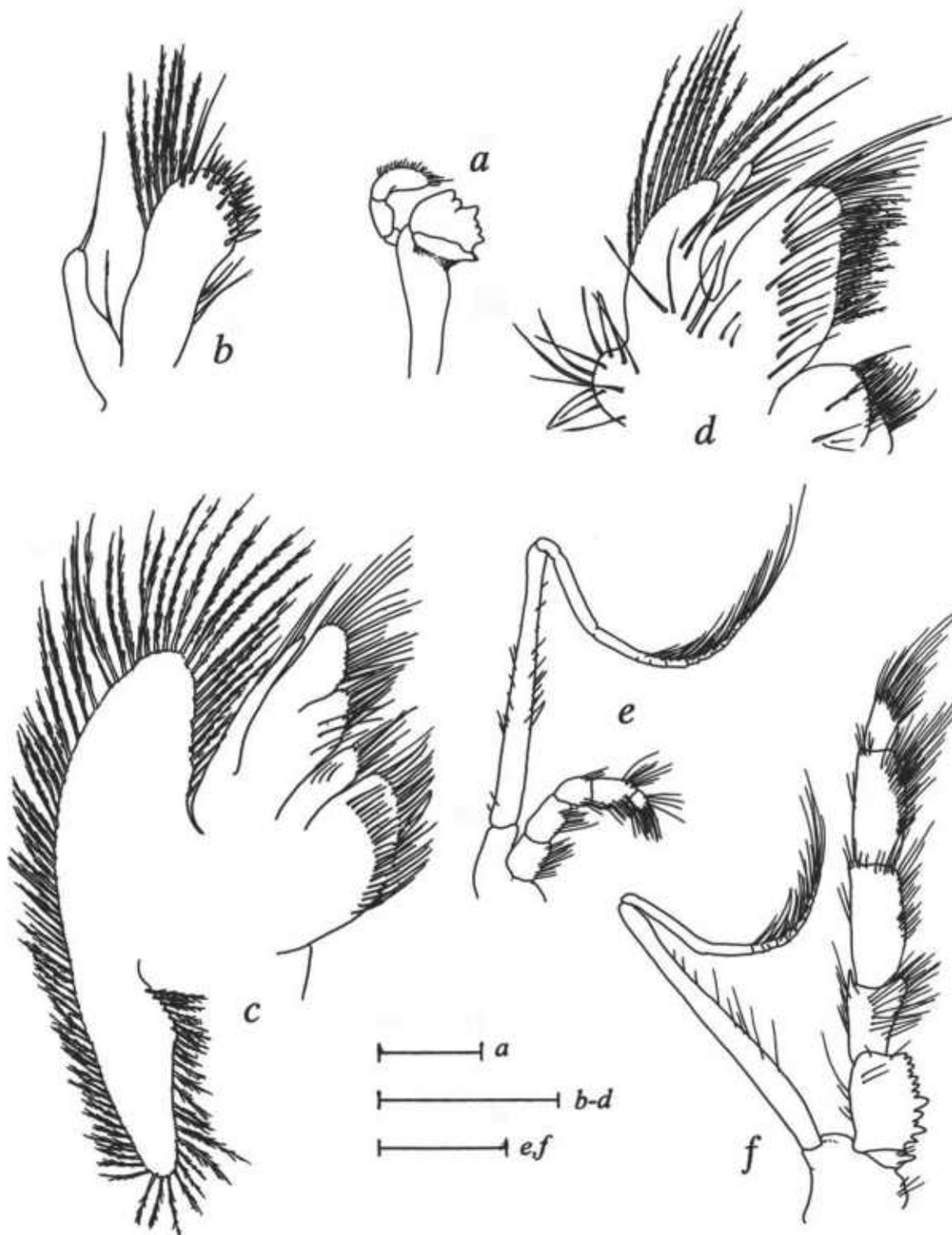


FIG. 8. — *Paragiopagurus insolitus* sp. nov., paratype ♂ (2.0 mm), KARUBAR Stn DW 28 (USNM 276037). Left mouthparts, internal view: a, mandible; b, maxillule (proximal endite not shown); c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped. Scales equal 0.5 mm (a), 1 mm (b-d), and 0.25 mm (e, f).

Antennular peduncle long, slender, exceeding distal margin of cornea by about one-fifth of penultimate segment. Ultimate segment twice as long as penultimate segment, with scattered setae. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe armed with small spine, and strong spine proximally. Ventral flagellum usually with 5 or 6 articles.

Antennal peduncle (Fig. 7b) exceeding distal margin of cornea by about one-fifth length of fifth segment. Fifth segment unarmed, but with scattered setae. Fourth segment with strong dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong, simple spine; mesial margin with spine on dorsodistal angle. First segment with lateral face unarmed; ventromesial angle produced, with row of 3 or 4 small spines laterally. Antennal acicles slightly curved outward (in dorsal view), slightly exceeding distal margins of corneae, terminating in strong spine; mesial margins armed with row of 10 to 13 spines. Flagellum long, exceeding extended right cheliped and ambulatory legs; with short setae 1 flagellar article in length or less.

Mandible (Fig. 8a) with incisor process consisting of several irregularly-shaped teeth. Maxillule (Fig. 8b) with external lobe of endopod obsolete, internal lobe with 1 long seta. Maxilla (Fig. 8c) with endopod exceeding distal margin of scaphognathite. First maxilliped (Fig. 8d) with endopod exceeding exopod in distal extension. Second maxilliped (Fig. 8e) with long, slender exopod about 10 times as long as broad. Third maxilliped (Fig. 8f) with long, slender exopod about 10 times as long as broad; merus with dorsodistal spine; crista dentata consisting of about 12 calcareous or corneous-tipped teeth; basis with 1 tooth mesially; coxa unarmed. Sternite of third maxillipeds with spine on each side of midline. Epistome (Fig. 7c) with median region strongly produced anteriorly (somewhat pyramid-shaped with ventral face concave); terminating in small, often inconspicuous blunt spine.

Chelipeds markedly dissimilar. Right cheliped (Fig. 7d-f) with sparse setae; surfaces of merus, carpus, and chela with some iridescence. Fingers weakly curved ventromesially, terminating in small, usually blunt corneous claws; cutting edges with irregularly-sized calcareous teeth. Dactyl shorter than length of mesial margin of palm, set at moderately oblique angle to longitudinal axis of palm; mesial margin broadly curved, weakly delimited proximally by irregular row of few small tubercles; dorsal face with scattered small tubercles and tufts of setae; ventral face elevated along midline forming longitudinal ridge. Fixed finger broad at base, dorsal face with scattered small tubercles and tufts of setae; lateral margin well delimited proximally by row of spines. Palm longer than broad, dorsolateral margin at most weakly delimited by row of small spines or tubercles; dorsomesial margin weakly delimited by row of small well-spaced spines; dorsal surface smooth or at most with scattered small spines or tubercles laterally and mesially; mesial face rounded, with scattered tubercles; ventral surface smooth. Carpus with rounded lateral and mesial faces; dorsal surface with irregular rows of small spines or tubercles; dorsomesial margin delimited in distal half by row of small spines; dorsodistal margin with 3 or 4 median spines; ventromesial margin with row of spines; ventral face with scattered small tubercles. Merus with scattered tubercles on dorsal and ventral faces; dorsal surface with longitudinal row of bristle-like setae, and row of setae on dorsodistal margin; ventromesial margin with row of spines. Ischium unarmed. Coxa with ventromesial and ventrolateral margins each with small distal spine.

Left cheliped (Fig. 7g) usually weakly calcified laterally on carpus and merus. Fingers terminating in small corneous claws; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of low small teeth. Dactyl about as long as length of mesial margin of palm. Palm unarmed; with scattered setae. Carpus with small dorsodistal spine; dorsal margin with bristle-like setae; ventral face smooth. Merus with bristle-like setae on dorsal margin; usually with small spine on ventrolateral margin, and 1 to 3 spines on ventromesial margin. Ischium unarmed. Coxa with ventromesial and ventrolateral margins each with small spine distally.

Ambulatory legs (Fig. 9a-d) similar right from left, exceeding extended right cheliped by approximately 0.25 length of dactyls. Dactyls broadly curved, each about 1.5 times as long as propodus, and terminating in sharp corneous claw; with dorsal and dorsomesial rows of long setae, and 5 to 8 minute spinules on ventromesial margin. Propodi each with row of short setae on dorsal margin. Carpi each with small dorsodistal spine, and short setae dorsally. Meri unarmed. Ischia unarmed or each with small spine on ventrolateral margin distally. Coxae of second pereopods each with 1 small spine distally and 1 small spine proximally on ventromesial margin; coxae of third pereopods unarmed. Anterior lobe of sternite of third pereopods (Fig. 9e) sub-semicircular, unarmed, setose.

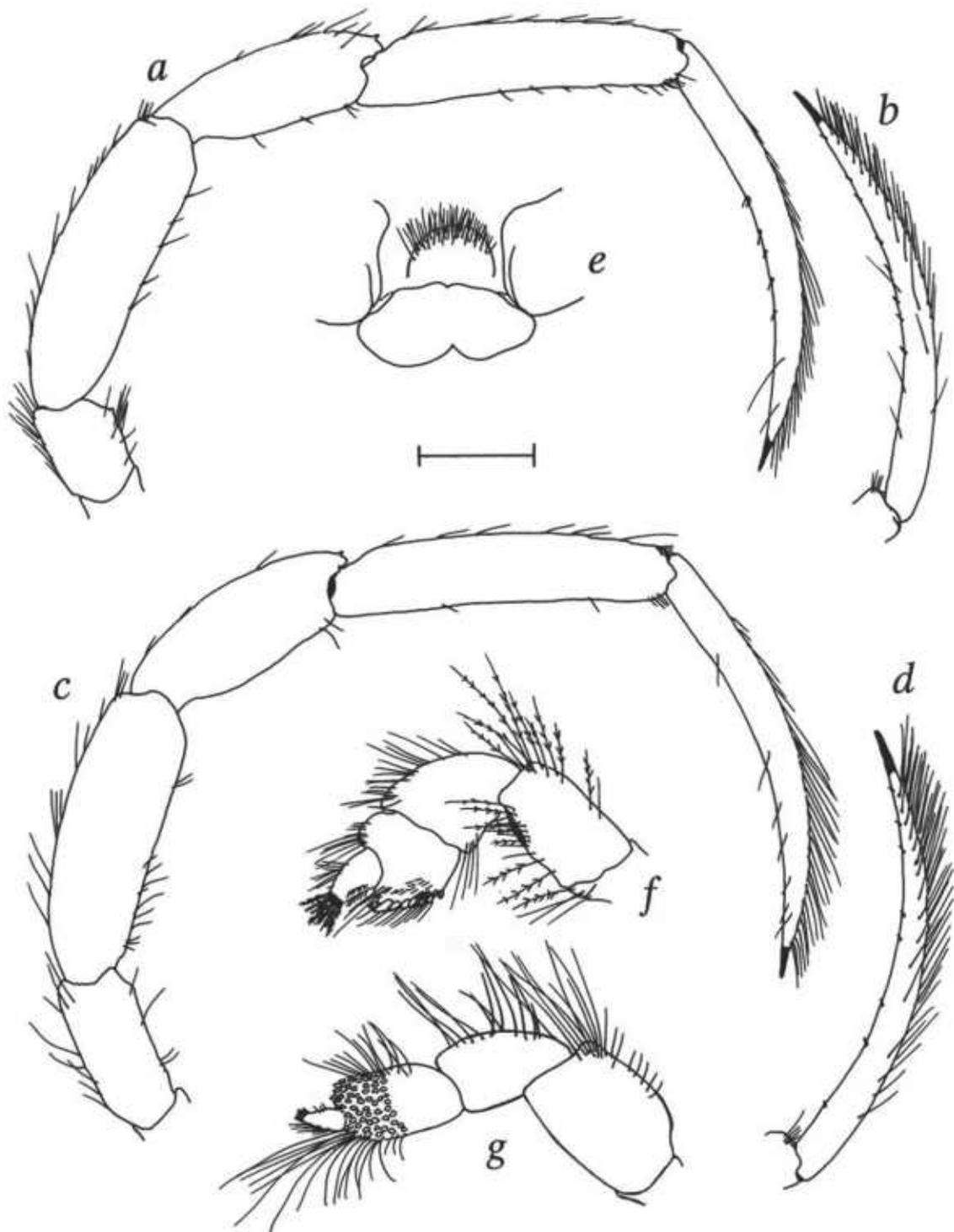


FIG. 9. — *Paragiopagurus insolitus* sp. nov., KARUBAR Stn DW 28. a-e, holotype ♂ (2.2 mm) (MNHN-Pg 5363); f-g, paratype ♂ (2.0 mm) (USNM 276037): a, right second pereopod, lateral view; b, dactyl of same, mesial view; c, right third pereopod, lateral view; d, dactyl of same, mesial view; e, sternite of third pereopods, ventral view; f, left fourth pereopod, lateral view; g, left fifth pereopod, lateral view. Scale equals 0.5 mm (a-d), and 0.25 mm (e-g).

Fourth pereopod (Fig. 9f, 10a) semichelate. Dactyl terminating in blunt corneous claw almost entirely masked by long, stiff plumose setae arising near base of claw; with ventrolateral row of small corneous spinules. Propodus shorter than greatest height; rasp formed of 1 row of rounded or ovate scales. Carpus with long setae on dorsal margin. Merus with rows of long plumose setae on dorsal and ventral margins.

Fifth pereopod (Fig. 9g) semichelate. Dactyl with about 4 or 5 fused corneous spines distally. Propodal rasp extending to mid-length of segment.

Gills phyllobranchiate.

Uropods and telson (Fig. 10b-c) markedly asymmetrical. Telson lacking transverse suture; dorsal surface with scattered setae; posterior lobes separated by wide and shallow unarmed cleft, terminal margins of lobes armed with long, often strongly curved corneous spines.

Males lacking first gonopods, and with paired second gonopods. Second gonopods (Fig. 10d) each with distal segment flat; distal segment with long setae marginally and on anterodistal face; basal segments each with scattered setae, with or without rudimentary exopod. Females lacking vestigial second right pleopod; fifth left pleopod not egg carrying.

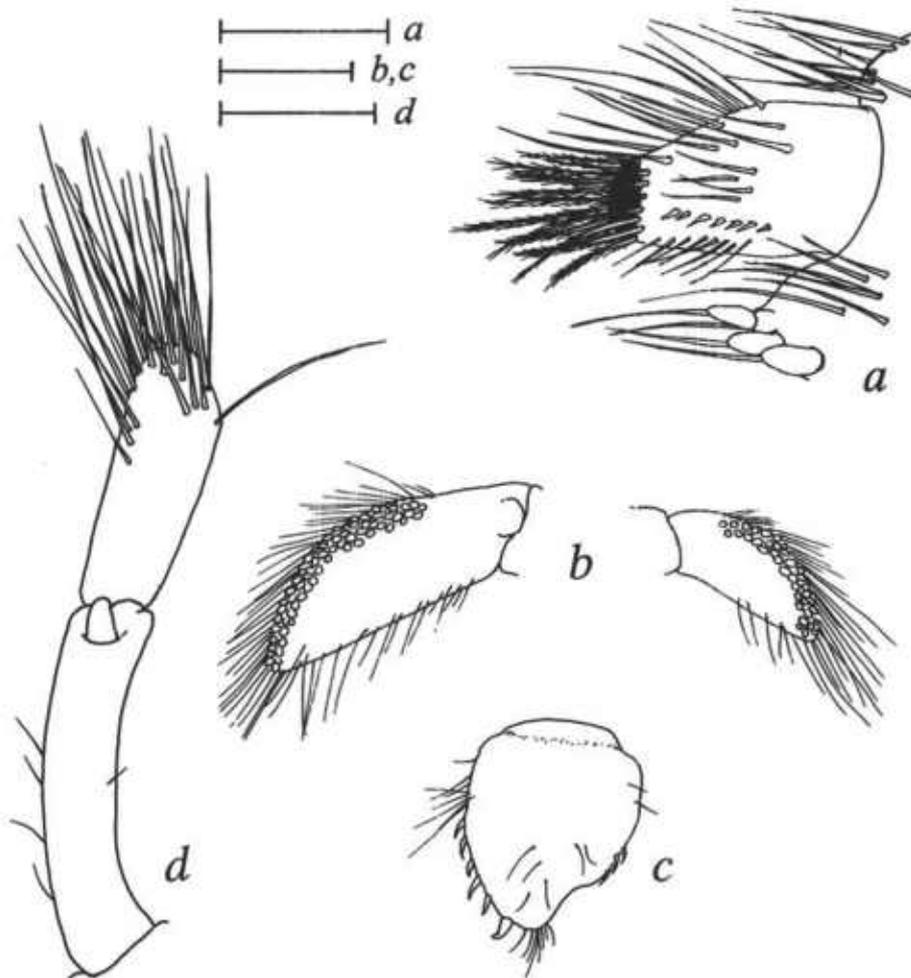


FIG. 10. — *Paragiopagurus insolitus* sp. nov., KARUBAR Stn DW 28. a, d, paratype ♂ (2.0 mm) (USNM 276037); b-c, holotype ♂ (2.2 mm): a, dactyl and distal end of propodus of left fourth pereopod, lateral view; b, left (b) and right (c) uropods, dorsal view; c, telson, dorsal view; d, left second gonopod, anterior view. Scales equal 0.2 mm (a), 0.5 mm (b, c), and 0.25 mm (d).

HABITAT. — Unknown (probably gastropod shells).

DISTRIBUTION. — Known so far only from the Kai Islands, Indonesia. Depth: 448 to 467 m.

ETYMOLOGY. — The specific name is from the Latin *insolitus*, unusual. The name is given for the unusual condition of the ocular acicles, epistome, maxillipeds, and fourth pereopods.

REMARKS. — *Paragiopagurus insolitus* sp. nov. is a singularly distinctive species. The shape or conformation of the ocular acicles, mouthparts, epistome, and dactyl of the fourth pereopod, are unusual or unique among parapagurids. The relative length of the terminal spine of the ocular acicles is the longest known for any parapagurid, and usually reaches nearly to midlength of the ocular peduncles. The incisor process of the mandible is unusual in that it consists of several irregularly-shaped teeth (Fig. 8a), rather than having a single small median tooth as in all other parapagurids for which the mandibles have been described. The second and third maxillipeds each have a very long and slender exopod that is nearly 10 times as long as broad (Fig. 8e-f); in other parapagurids the exopod is at most six times as long as broad. The epistome is strongly produced anteriorly, forming a somewhat pyramid-shaped process with a concave ventral face (Fig. 7c); in other parapagurids the epistome is evenly rounded.

The specialized setal arrangement seen on the dactyl of the fourth pereopod of *P. insolitus* sp. nov., is unique among parapagurids (Fig. 10a). The claw of the dactyl is almost entirely masked by long plumose setae that arise near the base and all around the claw. Although the function of this setal arrangement is unknown, it bears some similarity with that reported by DE SAINT LAURENT (1968a, b) and MCLAUGHLIN (1997) for species of the pagurid genus *Decaphyllus* de Saint Laurent, 1968.

Megalopa

Fig 11

MATERIAL EXAMINED. — Indonesia. KARUBAR, *Tanimbar Islands*: stn CP 59, 08°20'S, 132°11'E, 405-399 m, 31.10.1991: 1 specimen (CL 5.5 mm, TL 23.4 mm), in gastropod shell (USNM 276038). — Stn CP 87, 08°47'S, 130°49'E, 1017-1024 m, 5.11.1991: 1 specimen (CL 5.6 mm, TL 22.1 mm) (MNHN-Pg 5382).

REMARKS. — Although the two megalopal stage specimens reported herein evidently belong to the Parapaguridae, they cannot be assigned with certainty at the present time to any particular species. The complete larval rearing for any parapagurid species has not been achieved beyond the second zoeal stage (WILLIAMSON & VON LEVETZOW, 1967; PROVENZANO unpublished). The two KARUBAR specimens are identical morphologically, and appear to be of the same species.

Of the two KARUBAR stations where parapagurid megalopae were obtained, no adult parapagurid stages were found at Stn CP 59. Adult specimens of *Parapagurus latimanus* and *Oncopagurus minutus* were obtained at Stn CP 87; conceivably the megalopae might be of one of these two species. However, *O. minutus* is a species whose adult individuals are small, growing rarely to the size of the KARUBAR megalopae. Based on station co-occurrence and size, it is more likely that the megalopae are of *P. latimanus*, a species whose individuals can grow to a size considerably larger than these postlarvae.

The KARUBAR specimens show similarities with the megalopae assigned by LEMAITRE & MCLAUGHLIN (1992: 754, Figs 6-7) to *Sympagurus dimorphus* (Studer, 1883), but clearly differ at least in the cephalic shield, development of the rostrum, and armature of the chelipeds. The shield in the KARUBAR megalopae (Fig. 11a) has a more pronounced and longer median longitudinal ridge on the anterior half than in *S. dimorphus*. The rostrum is terminally rounded in both the KARUBAR and *S. dimorphus* megalopae; however, in the former, the rostrum has a membranous ventral extension (Fig. 11a-b) that is more developed than in the latter. The right and left chelipeds of the KARUBAR specimens have spines or small tubercles on the dorsomesial margins of the palm and dactyl, and on the dorsal margin of the carpus (Fig. 11c-d); the chelipeds are unarmed in the megalopae assigned to *S. dimorphus*.

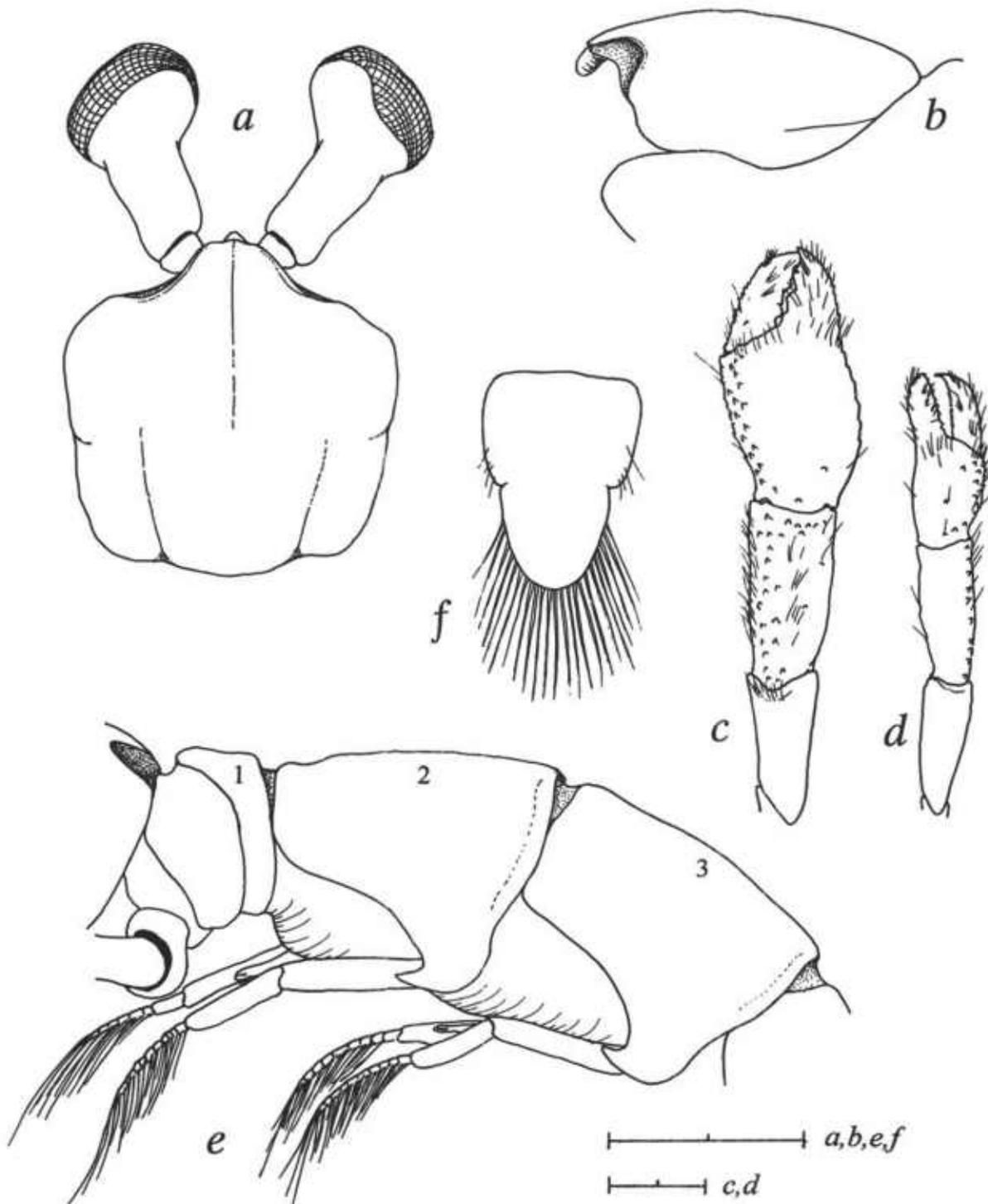


FIG. 11. — *Megalopa* (CL 5.6 mm, TL 22.1 mm), KARUBAR Stn CP 87 (MNHN-Pg 5382): a, shield and ocular peduncles; b, shield, left lateral view; c, right cheliped, dorsal view; d, left cheliped, dorsal view; e, abdominal somites 1-3, left lateral view; f, telson, dorsal view. Scales equal 2 mm.

GENERAL REMARKS AND LIST OF INDONESIAN PARAPAGURIDS

Recent studies based largely on specimens obtained during the KARUBAR campaign indicate that the Indonesian region harbors a previously unrecognized impressive diversity of hermit crabs of the family Paguridae (MCLAUGHLIN, 1997). The Indonesian parapagurid fauna contains a total of 15 species, or about 25% of the 59 species of the family currently known worldwide, and evidently does not approach the species richness of the Paguridae from the region. However, the discovery of two new species, *Oncopagurus glebosus* and *Paragiopagurus insolitus*, characterized by unusual or unique conditions previously unknown in the family, are indicative of the broad range of morphological diversity that exists in the Parapaguridae.

The following is a list of the 15 species and megalopa of Parapaguridae currently known from Indonesian waters, including references where diagnoses and illustrations can be found. An asterisk indicates that the species was not obtained during the KARUBAR campaign.

Parapagurus latimanus Henderson, 1888 — DE SAINT LAURENT (1972, as *P. pilosimanus latimanus*); LEMAITRE & MCLAUGHLIN (1992).

Strobopagurus sibogae (de Saint Laurent, 1972) — DE SAINT LAURENT (1972, as *Parapagurus sibogae*); LEMAITRE (1996).

**Sympagurus affinis* (Henderson, 1888) — DE SAINT LAURENT (1972, as *Parapagurus affinis*); LEMAITRE (1994).

Sympagurus brevipes (de Saint Laurent, 1972) — DE SAINT LAURENT (1972, as *Parapagurus brevipes*); LEMAITRE (1996).

**Sympagurus dofleini* (Balss, 1912) — LEMAITRE (1994).

Sympagurus papposus Lemaître, 1996 — LEMAITRE (1996).

**Sympagurus planimanus* (de Saint Laurent, 1972) — DE SAINT LAURENT (1972, as *Parapagurus planimanus*); LEMAITRE (1996).

**Sympagurus trispinosus* (Balss, 1911) — LEMAITRE (1996).

**Oncopagurus indicus* (Alcock, 1905) — LEMAITRE (1996).

Oncopagurus minutus (Henderson, 1896) — LEMAITRE (1996).

Oncopagurus monstrosus (Alcock, 1894) — LEMAITRE (1996).

Oncopagurus orientalis (de Saint Laurent, 1972) — DE SAINT LAURENT (1972, as *Parapagurus orientalis*); this report.

Oncopagurus glebosus sp. nov.

Paragiopagurus acutus (de Saint Laurent, 1972) — DE SAINT LAURENT (1972, as *Parapagurus acutus acutus*); LEMAITRE (1996).

Paragiopagurus insolitus sp. nov.

Megalopa (sp. indet.) — this report.

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